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MAPPING THE UTILIZATION OF THE LAND*

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General Principles

The principles of geographic mapping, properly so called, can hardly be said to be formulated. Geographic field work is still in its beginnings, and the geographic survey is not even projected. The mapping which the geographer must develop in connection with his studies will not be for the purpose of exhibiting topography, soils, or vegetation. Maps such as these he may be obliged to prepare in the course of his work if they are not already at his hand. The true geographic map, although based on maps of the sorts mentioned, must attempt to set forth economic conditions. Certainly the aim of such a map must be to represent the ways in which the people of the area make their living and the character of this living, in so far as these things can be confined within the inelastic frame of a map.

The Existing Economic Map

There exists at present one type of map that attempts to cover the field of pure geography, the so-called economic map. Usually it is prepared for a complex group of economic conditions and for large areas and is intended for classroom use. We have, for example, economic or industrial maps of North America, which attempt to show the important agricultural areas, forest tracts, mining districts, transportation lines, commercial centers, and even other features. The technique of these maps has not been worked out satisfactorily—perhaps it lies beyond the graphic capacity of an individual drawing. The symbols employed become complicated and confusing. They are hence of little use for the purpose of instruction, for which they are made. They encounter a still greater difficulty in the extraordinary amount of generalization which they involve and in the consequent, perhaps irrepressible, conflict between their graphic qualities and truth.

An Improved Economic Map

The problem may be attacked at the other end, in the mapping of a small area on a large scale. In this way simplicity of material is secured, and the amount of generalization is much reduced. To be successful, such a map should build up a panorama of its area and should definitely and completely represent the area both as the home and the place of business of the group that inhabits it. The analysis, thus undertaken, may be expected to bring out the distribution of the significant activities of the area, to suggest their interrelations, and to indicate the local opportunities and disabilities of production. This means a census-taking in map form, with two principal problems, a major one of selecting the economic conditions to be represented, and a secondary one of securing proper graphic expression. The present paper is concerned primarily with the former problem.

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* This paper may be considered to form the third in a series by the author, the first two of which have already been printed. These are: Proposal of an Agricultural Survey on a Geographic Basis, *19th Ann. Rept. Michigan Acad. of Sci.* (*1917*), pp. 79-86; A Soil Classification for Michigan, *20th Ann. Rept. Michigan Acad. of Sci.* (*1918*), pp. 83-91.

The minimum essential of a geographic map is that it shall portray the use to which the entire land surface is put. Possibly also it may be made to show the relative value of the different types of use and the degree of effectiveness of the utilization. A map of this sort is the final member of a trilogy, of which the other two are the topographic map and the soil map. It is the outgrowth of the two that precede it, is explained by them, and, in turn, serves to interpret them.

Grouping of Land Utilizations

Since utilization is the keynote, the map must distinguish first of all between productive and non-productive areas, or else between what the United States Census designates as improved and unimproved land. In the former classification the critical element is yield, in the latter, labor. In spite of their similarity the two concepts cannot be used interchangeably. All cultivated land is, of course, both improved and productive. Pastures and meadows are productive, but may be improved or unimproved, according to the manner of their establishment. It is desirable to keep in mind both sets of criteria, giving, however, major emphasis to the matter of productivity. In this way land utilizations may be classified in the following groups: (1) barrens, (2) woodlands, (3) permanent pastures and meadows, (4) cultivated lands, (5) town sites.

Barrens

In barrens are included areas too destitute of vegetation to serve for grazing or cutting of timber, such as recent sand dunes, beaches, and areas of bare rock. In general this is permanently waste land, in so far as direct use of soil and surface is concerned. Doubtful cases may be found in burned-over tracts in which the humus has been destroyed and the soil baked and in areas of severe soil erosion.

Woodlands

A double classification of woodlands is needed: (1) the first to designate *type* of forest growth, which may be by the method of the ecologist or by the similar forest-composition classification of the forester; (2) the other to show the *condition* of the forest. The latter opens up in part new problems, as the work of the Forest Service has been concerned with large tracts of forest and these have been differentiated mainly by composition and age. A grouping may be worked out on the following lines:

(a) Wood lots. Under this heading fall the smaller forest tracts in the agricultural sections, chiefly woods that belong to farms. The ordinary wood lot is not held for the value of its timber but is an appendage to the farming land and consists of land for which there has not been the time or means of clearing or else of land that it is difficult or undesirable to clear. Often it is a general utility tract on the poorest part of the farm. Here firewood and fence posts are secured, and stock is pastured when it is not desirable to have it on the usual pastures. It is not significant whether it contains valuable timber or not. Its principal importance is its place in the general economy of the farm, not as a distinct investment in timber land.

(b) Cut-over lands, including non-commercial "second growth." This is land from which at least the more valuable forest has been removed but which has not been diverted to other uses. It is temporarily therefore in a non-productive condition or nearly so. The classification is applicable only to large tracts. Small portions ordinarily are parts of farms and are there classified as wood lots or stump pastures. There may be irregular and incidental production from these lands, but in the main they are now waste lands, compared with what they once were and may become again. Where fires or erosion have followed deforestation in such manner that the soil is gone and where therefore forests cannot return within a reasonable number of years, the land should be placed in the "Barrens" class.

(c) Commercial timber land. In this case land will be valuable immediately and primarily for its timber. The line between cut-over land and timber must be drawn according to local circumstances that determine what constitutes commercial timber. Where mill lumber only is being produced, the yield in saw logs will determine the status of the forest tract. In other places a certain amount of timber of tie size and quality will be prerequisite to classification as of commercial value. This will be the ordinary condition. The modern forest survey covers determination of stand and merchantability in detail, and guidance may be had from this source. Tracts mapped as commercial timber should be kept distinct from all forest lands of the wood lot type.

Timber of scrub growth as a rule will be identified sufficiently by the "type" classification, as, for instance, blackjack oak and jack pine. A separate "condition" classification for scrub growths seems therefore unnecessary. For those rare instances in which forestry is being applied and in which the forest land is being made into a permanently producing tract, a third classification may be introduced by means of a superimposed symbol to indicate "treatment."

PERMANENT PASTURES AND MEADOWS

Under permanent pastures and meadows belong: (a) meadows, areas of wet land from which hay is cut and which may also be used at times for pasturage; (b) wood and stump pastures, partially cleared forest lands in transition from forest to grass land. These are used primarily for grazing, the timber being a remnant of small significance in the utilization of the land. There should also be included (c) other wild pastures, such as upland pastures on thin, dry soils, and (d) seeded pastures, a rare type of permanent pasture land, as most seeded pastures represent a temporary use of cultivated land.

CULTIVATED LANDS

The major divisions of cultivated lands are well established, namely agricultural and horticultural uses of land. In horticulture further simple subdivisions are possible because the product of an individual tract ordinarily remains the same through a series of years. We have therefore orchards, vineyards, truck land, and so on. In agricultural use, on the other hand, the crop of the individual field is commonly changed at frequent intervals. It is true that there are large districts in the South in which cotton is grown on a field continuously over long periods and that similarly there are lands in the Middle West on which nothing but corn is ever produced. Single-crop practices, however, are becoming more and more exceptional. Ordinarily the cropped lands can be distinguished best by crop series. In a crop series are to be included all the important crops commonly grown on the tract in question. The simplest illustration is found in the crop rotation. Here a certain number of crops are produced in a definite succession. A crop rotation constitutes a crop series, but the latter term is more comprehensive. Thus we may have a corn-oats-clover series in which these three crops may be grown (1) in definite rotation, (2) in accidental succession, or (3) under a system in which one farmer may emphasize one crop, a second another, according to individual choice. In spite of these variations of practice it should be readily recognizable that the utilization of a particular type of land is in the growing of one of these crops or of the group of them. A second series may be wheat-oats-timothy-clover. An individual crop therefore may appear in the designation of more than one crop series. The map, as executed on this basis, will differ widely from the crop of an individual year and even from such a map of a series of years. It is in fact not a crop map but a map of cropping practice. It will represent the formulas for the relation of cropping practices to type of land. The order in which crops appear in the series is of course not the order which they follow on the land, but a grouping according to their relative importance in the cropping practice. The most profitable crop or the most widely raised crop would therefore appear first. These series, it is believed, are in general in quite definite relation to type of land. Over most of the country farm practices are fairly well established. Even where they do change, a successful group of crops is more commonly expanded than abandoned. It is believed therefore that such a map will represent a considerable degree of stability.

TOWN SITES

Interesting and valuable studies may be made of the distribution of land use in an urban district. The distribution of residence sections of varying conditions, parks, vacant property, factory districts, retail business, wholesale and warehouse districts, and shipping terminals furnishes a field of inquiry that is almost untouched by the geographer. In this connection mapping would furnish material for detailed analysis of the locational factor in the evolution of a city. This study of dominant focal points and the distances of their influence is impossible without such a map and hence remains mostly undone. Work of this type would contribute valuable data to the "city plan" idea. The city plan is an attempt to find the best use of the land that constitutes the city. In other words, it tries to discover the geographic adaptations of the sections of a city instead of leaving this discovery to the scarcely less sure but vastly slower workings of natural growth.

VALUE OF THIS PLAN OF MAPPING

The outline as given emphasizes throughout the fact of productivity and differentiates between those areas that are at work and those areas that are being carried along as incumbrance. The plan also attempts to characterize manner and degree of utilization. Beyond these general principles it does not appear desirable to lay down a scheme of classification. Local conditions will point the necessary modifications for translating such a plan into practice.

Mapping of the land by such a plan supplies a definite objective to the geographer by a relatively exact method. It keeps in view its definite purpose, the intensive study of regional geography, and approaches it by a route that is direct though hard and tedious. It eliminates facile generalizations and the plausible and insecure reconnaissances that constitute too large a part of geographical literature. It invites, and probably necessitates, the co-operation of the economist, the agronomist, and the forester. In addition to furnishing badly needed material to the student of regional geography the mapping may serve broader purposes. The cognate fields of economics, agronomy, and forestry can draw therefrom. To the man financially interested in the area the map gives information of economic conditions. To the traveler it explains the country. The strategic value of such a map is indicated by the great detail in which military maps represent the use to which the land is put. In combination with soil maps this type of map may be utilized in the equalization of taxes, not merely by boards of review but also as a partial foundation for a scientific system of tax assessment, an institution that we now lack. Expectations of these and other possible uses are based on the fact that the projected map is a mode of analysis of economic conditions.

Its Final Application

There remains the final application of the study. By the time the plan has been converted into a map for a given area, the economic situation of that area is well understood. Hence the prospects of future development should be apparent. The next step, accordingly, is to state the most appropriate future uses of the land. Is land being cultivated that should not be? Is land idling that could be making a satisfactory growth of trees? Are there undeveloped grazing areas? What wild land may be developed as farm land in fairness to the men who will live upon it? The study of present utilization must inevitably bring up questions such as these. The map that shows land utilization is logically succeeded by the map that provides land classification. The economic map of the present must point out both nature and extent of the wastes and abuses of land. The land classification map, then, will indicate the best and most complete use of the land in the immediate future, especially the protection of lands that are being used improperly, the development of needlessly idle lands, and the change in the use of lands now unprofitably employed. Land classification proposes stimulated and remedial use, not by the assertion of means that are ultimate and without alternative but along lines that are proximate and feasible. The three steps follow inexorably: first the study of the soil, then the study of existing conditions, and finally the program to secure the best results possible in any near future.

Example

In connection with a detailed geographic study of a small area, a map of the type projected has been made.[1] The area involved is Bridgewater Township, Saginaw County, Michigan. Relief throughout is slight, as the area consists of lake beds and beaches, a water-laid moraine, and an obscure flood plain. The soils are silty and sandy, the sand content in general increasing as one goes south. There is no absolutely waste land. The main problem lies in the representation of agricultural use.

The original map recorded the employment of fields down to five-acre tracts in the crop season of 1918. Detailed notes were kept on crop practices. From this work it shortly became apparent (1) that a large number of crops are grown, (2) that the area planted to an individual crop on a single farm is small, and (3) that these crops can be combined into a small number of groups or crop series. The resultant generalization is Figure 1. The major series is hay-oats-corn-pasture. The order expresses the decreasing order of importance in the farm economy of the one type of land. Hay is the first crop. If this area were reduced to a considerably smaller scale map, say a map of Michigan, the entire area might appear as dominated by hay growing. Enough land is cultivated to grow the local supply of oats and much of the corn needed. After a number of years of cultivation fields are usually pastured for a period. The grass culture at both ends of the series suggests the importance of stock-raising. It is in fact a type of mixed small farm that emphasizes stock. With a somewhat more intensive cultivation of the same type of land a series beans-oats-hay-corn emerges,

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[1] This work is based on a field study by Miss M. K. Horning in the summer of 1918. The maps here represented are her interpretation of the principles set forth in the previous section.

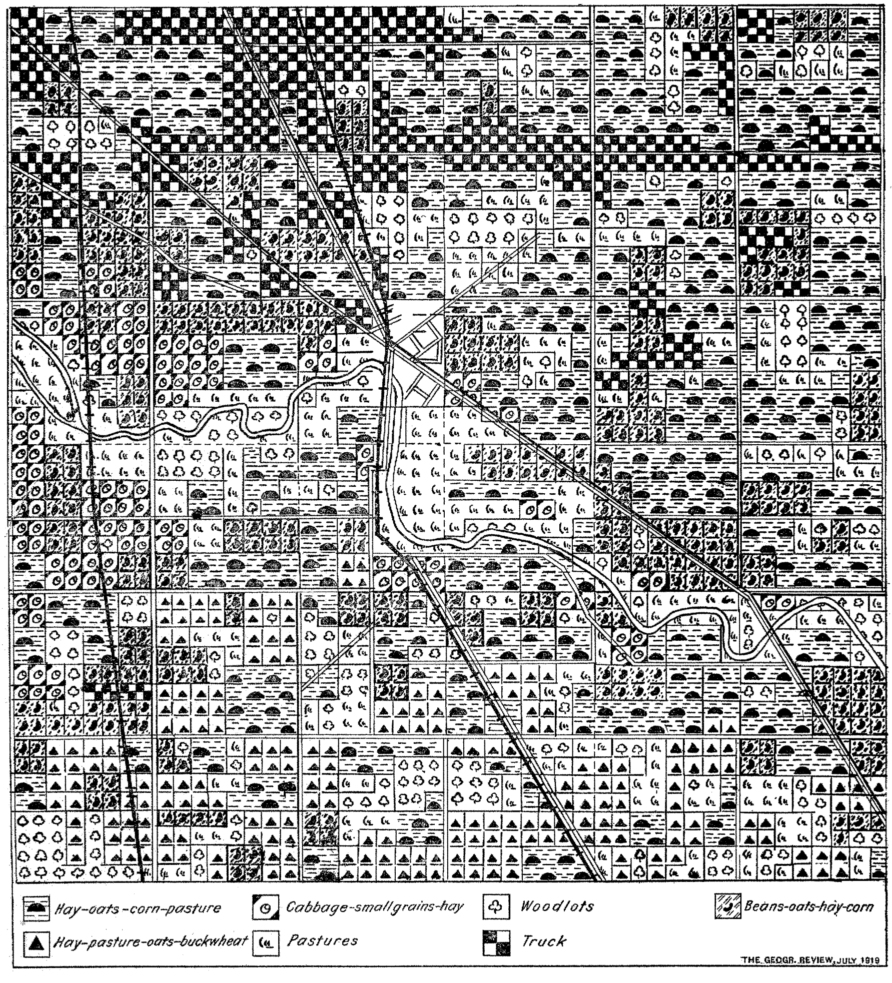

FIG. 1—Map showing, according to the method suggested in the paper, the utilization of the land in Bridgeport Township, Saginaw County, Michigan. Scale, 1:82,000.

in which the bean crop supplies the farm with ready money. The poor, sandy land to the south gives the group hay-pasture-oats-buckwheat. On rather heavy lake beds cabbage is the most important crop, and the series cabbage-small grains-hay is constituted. Finally there are the truck-growing sections, located mostly on sandy loam and along good roads. The cultivated land represents 71 per cent of the total surface.

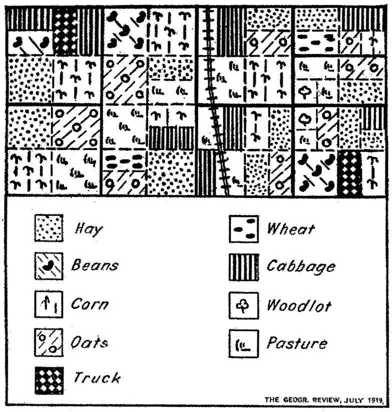

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FIG. 2—Map of northern half of Section 19, showing crops as grown in 1918. Scale, 1:31,680. Solid black lines represent farm boundaries, broken lines boundaries of fields.

Figure 2 represents a half section taken from the field map to show actual crop conditions in a typical section of the heavier lands. This is an adaptation of the type of study carried on by the Office of Farm Management of the U. S. Department of Agriculture on individual farms. In the present type of study it is proposed to supplement the generalized map of the type of Figure 1 with ungeneralized maps of the second type to show actual crops in a given year for the different type areas. In the further development of the plan it is expected that field mapping may be done directly in both types. The generalized map may be developed directly in the field by discovering the several crop practices. At type locations a section or even less may then be mapped in the ungeneralized form to furnish the specific illustration of the application of an individual crop practice.